

REMARKS

At the outset, Applicants' representative wishes to thank Examiner Dollinger for the courtesy exhibited during an interview conducted on June 8, 2010. During the interview, Applicants' representative discussed the patentability of the currently presented claims and claim language to make currently presented Claim 1 more clearly understood. As a result of the interview, Applicants' representative has a clearer understanding regarding what is needed to establish the patentability of the instant invention.

Claims 1-3, 5-9 and 11-13 have been rejected under 35 USC 112, second paragraph, as being indefinite. Claim 1 has been amended in order to overcome this rejection.

Claims 1-3, 5-9 and 11-13 have been rejected under 35 USC 103(a) as being unpatentable over Takei et al in view of Kumagai. Applicants respectfully traverse this ground of rejection and urge reconsideration in light of the following comments.

The presently claimed invention is directed to a resin composition which comprises a polyol, a polyisocyanate and a silane coupling agent containing an imidazole group as essential components. The ratio NCO/OH of the number of isocyanate groups of polyisocyanate to the number of hydroxyl groups in the polyol is from 0.6 to 4.0 and the weight ratio of the polyol and polyisocyanate combined to the silane coupling agent is from 100:0.01 to 100:10. The silane coupling agent containing an imidazole group is the reaction product of a reaction mixture consisting of either an imidazole compound and 3-glycidoxypropyltrimethoxysilane or an imidazole compound and 3-methacryloxypropyltrimethoxysilane and has a hydroxyl group in its molecule when it is obtained by a reaction of an imidazole compound and 3-glycidoxypropyltrimethoxysilane and does not have a hydroxyl group in its molecule when it is obtained by a reaction of an imidazole compound and 3-methacryloxypropyltrimethoxysilane.

As explained previously, the instant invention is based on the discovery that the unpleasant odor produced when using a tertiary amine compound as a catalyst in a reaction of a polyol and a polyisocyanate and a resin composition having improved curing and adhesion to metals, inorganic materials and organic materials could be obtained by combining the claimed silane coupling agent containing an imidazole group with at least one of a polyol and a polyisocyanate prior to the reaction of the polyol and polyisocyanate. The silane coupling agent containing an imidazole group of the present invention reacts with the polyisocyanate and/or the polyol and forms a three-dimensional network in the resin which enhances the properties of the cured product resin.

In the outstanding Office Action, the Examiner states that the claims are not limited to a reaction mixture of a separate polyol, polyisocyanate and a silane coupling agent containing an imidazole group but instead are directed to a resin composition comprising these components. First of all, in a polyurethane resin composition, a separate polyol and polyisocyanate are not present. These two compounds have reacted with each other to form the polyurethane. Moreover, a resin composition defines a conceptual precursor comprising several pre-reaction compounds and should not be considered as a "reaction mixture". In furtherance of this proposition, Applicants are enclosing herewith a copy of U.S. Patent Publication No. 2007/0293588 in which a curable resin composition is defined by the components that make up the resin composition. Therefore, Applicants respectfully submit that the phrase "resin composition" accurately describes the presently claimed invention.

As discussed previously, the Takei et al reference discloses a process in which a vinyl-based monomer is polymerized in the presence of an alcohol having no addition-polymerization reactivity by using an initiator consisting essentially of peroxide and at least one catalyst selected from the group consisting of an organic sulfonic acid compound

having no addition-polymerization reactivity and an inorganic acid. Prior to this reaction, this reference does not disclose the mixing of a silane coupling agent containing an imidazole group with at least one of the polyol and the polyisocyanate. This is not surprising since this reference specifically discloses that the reactor does not substantially contain any component other than the named vinyl-based monomer, alcohol, peroxide and catalyst. As such, this reference actually teaches away from adding the claimed silane coupling agent containing an imidazole group thereto.

The Kumagai reference discloses an organosilicon compound used as a surface-treating agent for improving the adhesion of a metal such as copper, steel or aluminum or an inorganic substance such as glass fibers, silica, aluminum oxide or aluminum hydroxide to a resin. The organosilicon compound disclosed in this reference encompasses the silane coupling agent containing an imidazole group of the present invention and this reference discloses that this organosilicon compound can be used as a resin additive for a thermoplastic or thermosetting resin and an epoxy resin is specifically exemplified. There is no suggestion in this reference of adding the organosilicon compound disclosed there to the precursor components of a polyurethane resin.

The Examiner has argued in the final rejection that imidazoles are known catalysts for urethane-forming reactions and has specifically cited the Rasshofer reference as showing that 1,2-dimethylimidazole and 2-methylimidazole are known tertiary amine polyurethane catalysts. Applicants readily admit that imidazole compounds have been used as catalysts as discussed in paragraph [0004] of the present specification. However, it is also further disclosed that the prior art imidazole compounds were less than completely satisfactory when it comes to adhesion to organic and inorganic materials. The objective test data provided in the present specification shows the unexpected advantages associated with using the

silane coupling agent containing an imidazole group of the present invention.

On pages 8-14 and in Figure 1 of the present specification, objective test data is presented which shows the unexpected benefits gained by using the silane coupling agent containing an imidazole group of the present invention. In Examples 1 and 2 and Comparative Examples 1-4, the curing promotion effect of an imidazole group-containing silane coupling agent of the present invention was evaluated against 3-glycidoxypropyltrimethoxysilane as a common silane coupling agent in Comparative Example 1, 2-ethyl-4-methylimidazole as a conventional imidazole catalyst in Comparative Example 2 and triethylamine in Comparative Example 3. As discussed in paragraph [0029], in the reaction system in which an imidazole group-containing silane coupling agent was added, the residual isocyanate group content was lower than that of the system to which no catalyst was added.

In Examples 3 and 4 and Comparative Examples 5-11, the contribution of the imidazole group-containing silane coupling agent to the increased adhesion to a base material was evaluated. Examples 3 and 4 use imidazole silane compounds according to the present invention while Comparative Example 5 used 3-glycidoxypropyltrimethoxysilane, Comparative Example 6 used 3-aminopropyltriethoxysilane, Comparative Example 7 used 3-mercaptopropyltrimethoxysilane, Example 8 used 2-ethyl-4-methylimidazole and Comparative Examples 9 and 10 used tertiary amines. As shown in the results contained in Table 1, the imidazole silane compounds of the present invention resulted in the resin composition exhibiting superior adhesion. This is clearly not suggested by the prior art cited by the Examiner.

The corrosion resistance effect of the imidazole group-containing silane coupling agent of the present invention was evaluated in Examples 5 and 6 and Comparative Examples 12-15. In Examples 5 and 6, imidazole silane compounds of the present invention were used while Comparative Example 12 used

3-aminopropyltriethoxysilane, Comparative Example 13 used 2-ethyl-4-methylimidazole and Comparative Example 14 used a tertiary amine. As shown in Table 2, the imidazole silane coupling agents of the present invention resulted in an increased corrosion resistance as compared to the comparative additives while still eliminating the unpleasant odor associated with conventional tertiary amine catalysts. The test results discussed above are clearly sufficient to establish the patentability of the presently claimed invention over the prior art cited by the Examiner.

The Examiner is respectfully requested to reconsider the present application and to pass it to issue.

Respectfully submitted,


Terryence F. Chapman

TFC/smd

| | | |
|--------------------------|-------------------------|-----------------|
| FLYNN, THIEL, BOUTELL | Terryence F. Chapman | Reg. No. 32 549 |
| & TANIS, P.C. | Mark L. Maki | Reg. No. 36 589 |
| 2026 Rambling Road | Liane L. Churney | Reg. No. 40 694 |
| Kalamazoo, MI 49008-1631 | Brian R. Tumm | Reg. No. 36 328 |
| Phone: (269) 381-1156 | Heon Jekal | Reg. No. 64 219 |
| Fax: (269) 381-5465 | Eugene J. Rath III | Reg. No. 42 094 |
| | Dale H. Thiel | Reg. No. 24 323 |
| | David G. Boutell | Reg. No. 25 072 |
| | Sidney B. Williams, Jr. | Reg. No. 24 949 |

Encl: U.S. Patent Publication 2007/0293588 A1
Postal Card

136.07/05